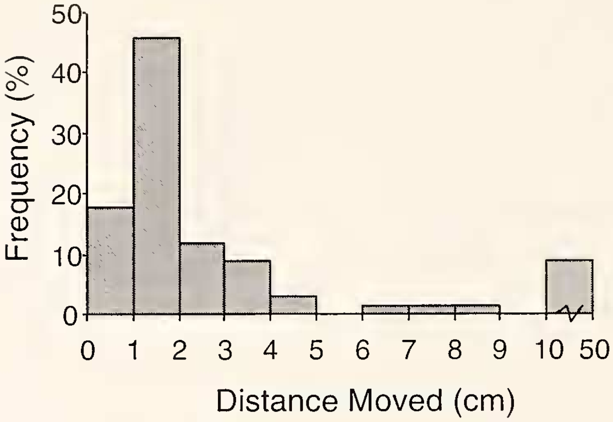

Figure 2. Frequency distribution of distances moved by tagged mussels. Mussels were pooled over habitats (tidepools, emergent rock), positions (in patch, outside) and dates (August 1994, July and October 1995). Sample size, n = 68.

found no distortion over 20 months of circles painted on undisturbed beds of *Mytilus californianus*, Conrad, 1837, although circles gradually became distorted if mussels were removed from an adjacent area. Mobility of mussels may depend on the availability of free space, the habitat type, and the species of mussel. Low mobility may be characteristic of *M. californianus*, the dominant mussel on the West Coast of North America. *M. californianus* crawls less rapidly (Harger, 1968), and has a stronger byssal attachment than other mytilids such as *Mytilus edulis*, *M. trossulus*, and *M. galloprovincialis* Lamarck, 1819 (Harger, 1970; Bell & Gosline, 1997).

In our study, mussels inside patches, which are bound by the byssal threads of their neighbors as well as their own attachment to the substratum, moved less frequently than mussels outside of patches. Movement rates of mussels within patches were two to three times higher in July than in October 1995, whereas movement rates of individuals outside of patches were similar in the two seasons. Byssal attachment of mussels varies seasonally (Price, 1980; Hunt & Scheibling, 2001b), and active movement by crawling may be easier in summer when byssal attachments are weaker (Hunt & Scheibling, 2001b) than in the fall.

The distances moved by tagged mussels in our study were generally small (< 10 cm), resulting in changes in the position of a mussel within a patch or, less frequently, in emigration to a new patch (natural patches were usually separated by 5–15 cm). Distances of movement did not vary seasonally, between habitats, or between individuals inside or outside of patches. Movement within a patch may result in changes in growth rate or risk of predation, as these factors may vary with position in a patch (e.g., Okamura, 1986). Movement to a new patch may have similar consequences, as growth rate often depends on patch size (Okamura, 1986; Newell, 1990; Svane & Ompi, 1993; Hunt & Scheibling, 2001a).

Many of the tagged mussels disappeared during the study (e.g., up to 27% of individuals tagged in summer). Although there may have been some tag loss, we believe that most of these individuals were dislodged by waves. Wave dislodgment is an important cause of disturbance for mussels on rocky shores (e.g., Paine & Levin, 1981). Loss rates of mussels in this study were consistent with probabilities of wave dislodgment calculated for mussels at Cranberry Cove using measurements of attachment strength and wave forces (Hunt & Scheibling, 2001b). The disappearance rate of mussels in tidepools was greater in October than July 1995, but did not differ between seasons on emergent rock. Dislodgment rates depend on both the wave forces imposed on individuals and on their attachment strength at a given time. Attachment strength and wave action vary seasonally, and these variations may counteract one another to dampen seasonality in the probability of wave dislodgment (Hunt & Scheibling, 2001b). At Cranberry Cove, wave forces are slightly higher on emergent rock than in tidepools (Hunt & Scheibling, 2001b). However, between-habitat differences in probability of dislodgment of mussels were predicted to vary over time as a result of variations in attachment strength. Some of the mussels dislodged by waves likely attach in new locations. We found that both juvenile and adult mussels immigrate into mussel patches (Hunt & Scheibling, 2001a) and colonize cleared areas (Hunt & Scheibling, 1998b).

In summary, we have documented movements of mussels in undisturbed patches on a wave-exposed shore. Detailed monitoring of individual mussels, such as that done in this study, can reveal small movements that otherwise may be overlooked. Such movements potentially have consequences for rates of growth and risk of predation of mussels, since these rates vary with patch size and position within a patch. We also measured rates of loss of mussels that were consistent with our previous predictions of rates of wave dislodgment at Cranberry Cove (Hunt & Scheibling, 2001b). These results, together with our previous work on colonization (Hunt & Scheibling, 1998b) and patch dynamics (Hunt & Scheibling, 2001a) of mussels at this site, demonstrate that postlarval dispersal can play an important role in the dynamics of mussel aggregations on rocky shores.

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Ankoravaratra, a New Genus of Land Snails Endemic to Northern Madagascar (Cyclophoroidea: Maizaniidae?)

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Abstract. ***Ankoravaratra***, gen. nov. has a simple shell resembling that of the East-African subgenus *Maizania* (*Micromaizania*) Verdcourt, 1964, from which it differs in having opercular coiling only half as tight. In reproductive morphology, ***Ankoravaratra***, gen. nov. differs substantially from all anatomically known cyclophoroids, including maizaniids, so its familial placement remains uncertain. The genus contains five species, of which four are new and one is transferred.

INTRODUCTION

This paper is one in a series reporting taxonomic results from the author's 1992–1996 survey and inventory of Madagascar's land mollusks (references in Emberton, 2002).

MATERIALS AND METHODS

Materials were collected in 1995 using methods of Emberton et al. (1996). Identification and comparisons were made using Bequaert & Clench (1936), Wenz (1938–1944), Tielecke (1940), Morton (1952), Zilch (1959–1960), Solem (1959), Verdcourt (1963, 1964), Thompson (1969), Girardi (1978), Bruggen (1982, 1985, 1986, 1990), Fischer-Piette et al. (1993), and Emberton & Pearce (1999), and using the collections of the Florida Museum of Natural History. Templeton's (1989) cohesion concept was applied in delimiting species. Measurements were made using an ocular micrometer on a Wild M3C dissecting microscope. Dissections were on black wax under 70% ethanol, following procedures of Emberton & Pearce (1999:figures 32, 49, 50). Photographs were taken at standard magnifications (10× and 25×).

LOCALITIES

Of the 1126 stations collected throughout Madagascar in 1992–1996, only the following 11 stations—all northern—yielded ***Ankoravaratra***, gen. nov.

191–195. Montagne d'Ambre National Park, rainforest. 191. 12°35′S, 49°09′E, 1260 m, 11 July 1995. 192–195. 12 July 1995. 192. 12°35′S, 49°08′E, 1235 m. 193–194. 12°34′S, 49°09′E. 193. 1305 m. 194. 1280 m. 195. 12°31′S, 49°10′E, 1050 m.

201–213. Analamera Reserve. 201, 203. 12°44′S, 49°30′E. 201. 315 m, dry deciduous forest, 15 July 1995. 203–213. 16 July 1995. 203. 285 m, bamboo-dry deciduous thicket. 210, 213. 12°44′S, 49°29′E, dry deciduous floodplain forest. 210. 35 m. 213. 30 m.

256. South of Vohimar, 13°35′S, 49°59′E, 90 m, viny rainforest, 2 September 1995.

405, 407. Cap d'Ambre, Ambongoabo, 12°15′S, 49°15′E. 405. 320 m, baobab-deciduous forest, 25 August 1995. 407. 290 m, dry deciduous forest, 26 August 1995.

SYSTEMATICS

Higher classification follows Ponder & Lindberg (1997; above superfamily) and Vaught (1989; superfamily and family). Latitudes and longitudes are given in degrees and minutes. To aid future workers, alcohol-preserved paratypes are listed separately. Types are placed in the Florida Museum of Natural History, University of Florida, Gainesville (UF); the Australian Museum, Sydney (AMS); the Academy of Natural Sciences of Philadelphia (ANSP); and the Muséum National d'Histoire Naturelle, Paris (MNHN, which does not assign catalogue numbers to types).

Class GASTROPODA

Clade CAENOGASTROPODA

Clade ARCHITAENIOGLOSSA

Superfamily CYCLOPHOROIDEA

Family MAIZANIIDAE?

Ankoravaratra Emberton, gen. nov.

(Figures 1–33)

Type species: ***Ankoravaratra ambrensis***, sp. nov.

Other species: ***A. ambalaniranae***, sp. nov.; ***A. analamerae***, sp. ***nov***.; ***A. capdambrae***, sp. nov.; ***A.*** *imani*

(Fischer-Piette, Blanc, Blanc & Salvat, 1993), comb. nov.

Diagnosis: ***Ankoravaratra***, gen. nov. has a simple shell and thin, horny, single-layered, nearly circular, spiral operculum resembling those of East-African subgenus *Maizania* (*Micromaizania*) Verdcourt, 1964, from which it differs in having opercular coiling only half as tight (opercular whorls equal to number of shell whorls versus double the number of shell whorls).

Anatomically, ***Ankoravaratra*** resembles *Owengriffithsius* (Emberton, 2002) in its bulbous-tipped penis in which seminal tube is enclosed (no seminal groove), apically looped, and subapically opening, and which bears a thick, semi-circular, flaplike gland; but ***Ankoravaratra*** has an extremely different shell morphology and has single-saccate (versus double-saccate) bursa copulatrix.

In penial morphology, ***Ankoravaratra*** differs substantially from all other (of the relatively few) anatomically known cyclophoroid genera, including maizaniids *Maizania* Bourguignant, 1889; *Maizaniella* Bequaert & Clench, 1936; and *Neomaizania* Bruggen, 1985.

Female reproductive system of ***Ankoravaratra***, gen. nov. is drastically different from that of type species of *Maizania* in its unstalked (versus long-stalked) bursa copulatrix, absence (versus presence) of accessory sac on seminal receptacle, and relatively short and S-shaped (versus long and very convoluted) seminal receptacle.

Conchologically, *Theobaldius* G. Nevill, 1878, has similar operculum, shell shape and size, and smoothish sculpture to ***Ankoravaratra***, gen. nov., but its peristome is more broadly reflected and is either doubled, or has a distinct anal notch, or both.

Other cyclophorid genera with similar operculum, such as *Cyclophorus* Montfort, 1810, have much larger, more robust shells with much thicker, more reflected peristomes.

Ptychopoma Möllendorf, 1885, has a somewhat similar shell, but its operculum is thick and calcified and its sculpture is not smoothish.

Other cyclophorid general that can be similar in shell shape and size, such as *Cyclotus* Swainson, 1840, and *Poteria* Gray, 1850, have extremely different opercula.

Description: Shell depressed-helicoid, diameter 6.4–9.6 mm, height/diameter 0.5–0.8, whorls 4.2–5.7, umbilicus/diameter 0.23–0.33. Spire low conic, sides of apex generally slightly concave. Body-whorl periphery rounded; suture deeply impressed, simple; whorl shoulders rounded. Aperture round; pre-apertural downward deflection slight, approximately 0.1 whorl. Apertural lip unreflected at upper suture, grading to partially and very narrowly reflected at umbilicus. Embryonic whorls 1.7–2.0; first 1.5 whorls 0.96–1.15 mm in diameter. Embryonic sculpture smooth. Body-whorl sculpture either smooth, with faint, irregular, axial growth lines; or with low, dense riblets. Color generally light, often with whitish flecks, sometimes with single, reddish brown, peripheral color band.

Operculum fairly thin, horny, orange-yellow, broadly ovate, nearly circular, with parietal edge straight and rolled inward. Nucleus slightly eccentric toward baso-columellar edge. Whorls gradually and evenly increasing, approximately equal in number to shell whorls. On both external and internal surfaces, whorls bearing a low, broad, spiral ridge near suture. External surface smooth, glossy; internal surface rougher, with substructure resembling spirally radiating cross-laminated layers of parallel fibers.

Foot relatively short and broad, undivided. Snout short, divided into two lobes by narrow, central cleft. Testis large, nearly completely displacing apical digestive gland. Penis with completely enclosed seminal tube, without seminal groove. Penis cylindrical, apically swelling then tapering and coiling back on, and adhering to, itself in a 230–260° loose spiral. Penial pore thus subapical behind bulbous, false tip, and opening to side, but angled somewhat forward. Within penial pore, through translucent wall of true tip of the penis, a terminal, invaginable, intromittant portion of penis is visible. Left side of penis bearing a thick, semi-circular, flaplike gland that rolls partially around penial shaft. Ovary relatively small, lying along inside curve of apical digestive gland, consisting of tightly packed, bulbous acini. Oviduct (= "tube of FPSC" of Emberton & Pearce [1999]) with a sharp, V-shaped bend before running alongside, then tapering into, seminal receptacle. Seminal receptacle (= "albumen gland" of Thompson [1969] = "glandular base of FPSC" of Emberton & Pearce [1999]) narrow and V- to U-shaped shortly after its indistinct junction with oviduct, then swelling greatly and forming an S-shaped curve that straightens distally, before its junction with bursa copulatrix. Bursa copulatrix (= "seminal receptacle" of Thompson [1969] = "gland of FPSC" of Emberton & Pearce [1999]) a single, ductless sac.

Etymology: Malagasy "snail" (ankora) of the "north" (avaratra), for the strictly northern distribution of this genus in Madagascar.

Gender: Feminine.

Key to Species of *Ankoravaratra*:

1a. Diameter of first 1.5 whorls less than 1.00 mm 2
1b. Diameter of first 1.5 whorls greater than 1.00 mm 3
2a. Diameter of first 1.5 whorls about 0.89 mm; inhabiting dry-deciduous forest on limestone karst .... *imani*
2b. Diameter of first 1.5 whorls 0.96–0.98; inhabiting rainforest on non-calcareous base rock .... ***ambalaniranae***
3a. Body-whorl sculpted with low, dense riblets;

body-whorl periphery faintly angulate; inhabiting rainforest .... ***ambrensis***

3b. Body whorl smooth, with only faint, irregular growth lines; body-whorl periphery round; inhabiting dry-deciduous forest 4

4a. Diameter of first 1.5 whorls 1.10–1.15 mm; embryonic whorls 1.7–1.8; umbilicus broader, 0.29–0.32 shell diameter; shell generally with color band .... ***analamerae***

4b. Diameter of first 1.5 whorls 1.03–1.06 mm; embryonic whorls 1.9–2.0; umbilicus narrower, 0.23–0.27 shell diameter; shell generally without color band .... ***capdambrae***

Species Descriptions

Ankoravaratra ambalaniranae Emberton, sp. nov. (Figures 25–29)

Diagnosis: Unique within genus for its combination of small initial-whorl size (diameter of first 1.5 whorls 0.96–0.98 mm) and rainforest habitat.

Holotype: Station 256 (UF 285436, 1 ad).

Illustrated dry paratypes: Station 256 (UF 285437, 3 ad, 1 juv).

Other dry paratypes: Station 256 (AMS C. 204777, 1 ad; ANSP 407915, 1 ad; MNHN, 1 ad; UF 285477, 4 ad, 7 juv).

Type locality: Madagascar, South of Vohimar, 13°35′S, 49°59′E, 90 m, viny rainforest.

Description of holotype shell (Figure 25): Female. Diameter 9.6 mm, height 6.5 mm, whorls 5.3, umbilicus 2.8 mm. Spire low conic, sides of apex slightly concave. Body-whorl periphery rounded; suture deeply impressed, simple; whorl shoulders rounded. Aperture round; height 3.6 mm, width 3.6 mm; downward deflection slight, 0.1 whorl. Apertural lip reflection grading from zero degrees at upper suture to about 60 degrees at umbilicus, narrow. Embryonic whorls 1.9; first 1.5 whorls 0.98 mm in diameter. Embryonic sculpture smooth. Body-whorl sculpture smooth, with faint, irregular, axial growth lines. Color light beige with white flecks. No color band.

Shell variation: See Table 1 and Figures 26–29.

Operculum (Figure 29): As for the genus.

Etymology: For Mount Ambalanirana, north of Sambava.

Ankoravaratra ambrensis Emberton, sp. nov. (Figures 1–19)

Diagnosis: Unique within the genus for its body-whorl sculpture of low, dense riblets and its faintly angulate body-whorl periphery.

Holotype: Station 191 (UF 285442, 1 ad).

Illustrated dry paratypes: Station 191 (UF 285443, 4 ad, 1 juv, 2 operc).

Illustrated alcohol paratypes: Station 191 (UF 285571, 6 ad [dissected]).

Other dry paratypes: Stations 191 (AMS C. 203496, 3 ad, 2 operc; ANSP 407916, 3 ad, 1 operc; MNHN, 3 ad, 1 operc; UF 285567, 28 ad, 63 juv); 192 (UF 285569, 3 ad, 3 juv); 193 (UF 285568, 5 ad, 8 juv); 194 (UF 285570, 2 ad); 195 (UF 285566, 1 ad).

Other alcohol paratypes: Stations 191 (UF 285572, 11 ad, 2 juv); 192 (UF 285573, 1 ad).

Type locality: Madagascar, Montagne d'Ambre National Park, 12°35′S, 49°09′E, 1260 m, rainforest.

Description of holotype shell (Figure 1): Female. Diameter 8.7 mm, height 5.7 mm, whorls 4.7, umbilicus 2.3 mm. Spire low conic, sides of apex slightly concave. Body-whorl periphery rounded, with just faint trace of angulation; suture deeply impressed, simple; whorl shoulders rounded. Aperture round; height 3.3 mm, width 3.4 mm; downward deflection slight, 0.1 whorl. Apertural lip reflection grading from zero degrees at upper suture to about 60 degrees at umbilicus, narrow. Embryonic whorls 1.8; first 1.5 whorls 1.09 mm in diameter. Embryonic sculpture smooth.

Body-whorl sculpture consisting of low, dense riblets, continuing into umbilicus. General color orangish beige with whitish flecks. Color band present, subperipheral, reddish brown.

Shell variation: See Table 1 and Figures 2–5.

Operculum (Figures 6, 7): As for the genus.

Anatomy (Figures 8–19, ethanol-fixed and -preserved): As for the genus.

Etymology: For Montagne d'Ambre (Amber Mountain) National Park.

Ankoravaratra analamerae Emberton, sp. nov. (Figures 20–24)

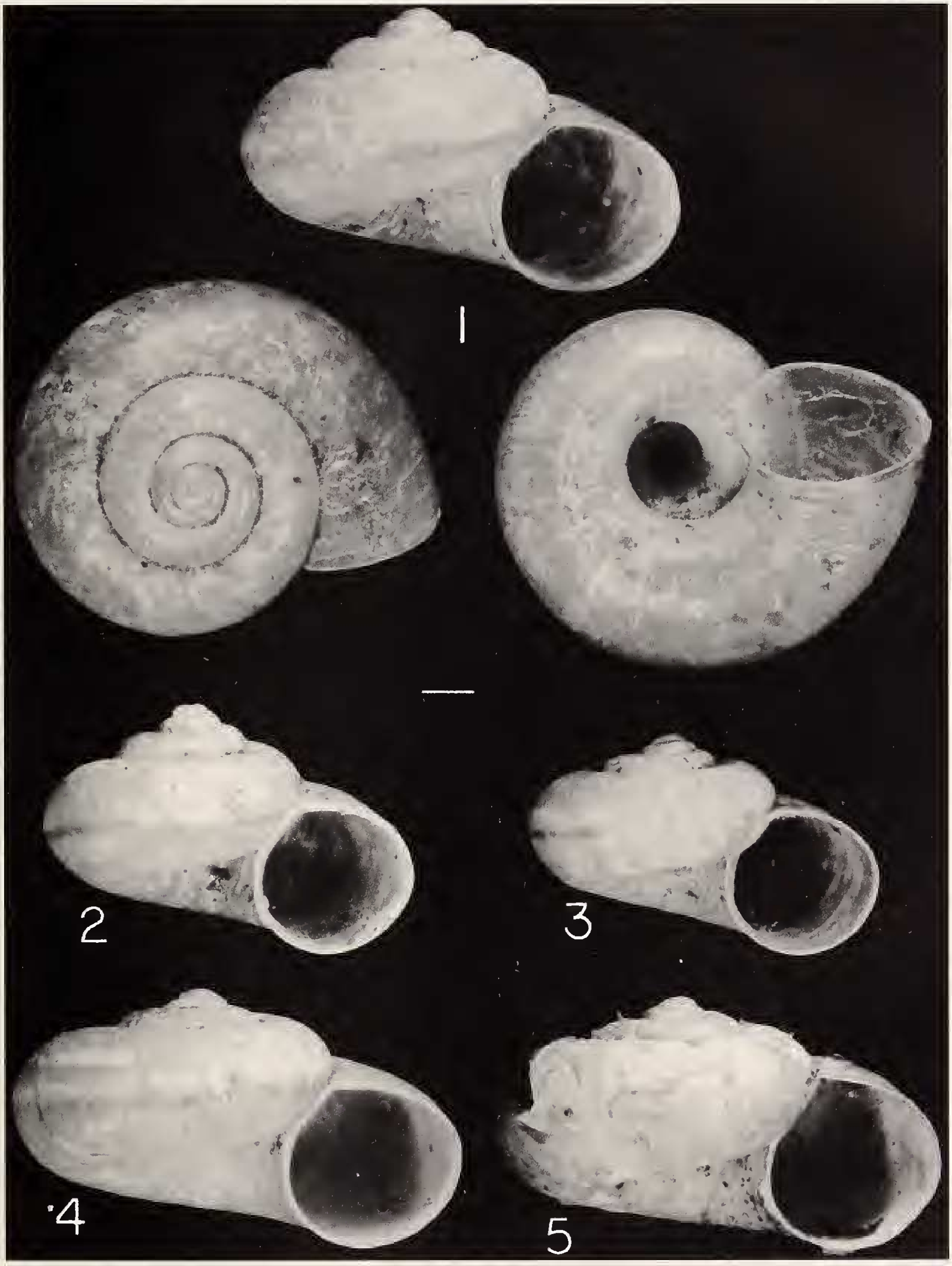
Diagnosis: Unique within the genus for its large initial whorl size (diameter of first 1.5 whorls 1.10–1.15 mm).

Holotype: Station 213 (UF 285438, 1 ad).

Illustrated dry paratypes: Stations 201 (UF 285440, 2 ad); 203 (UF 285441, 1 ad); 213 (UF 285439, 1 ad).

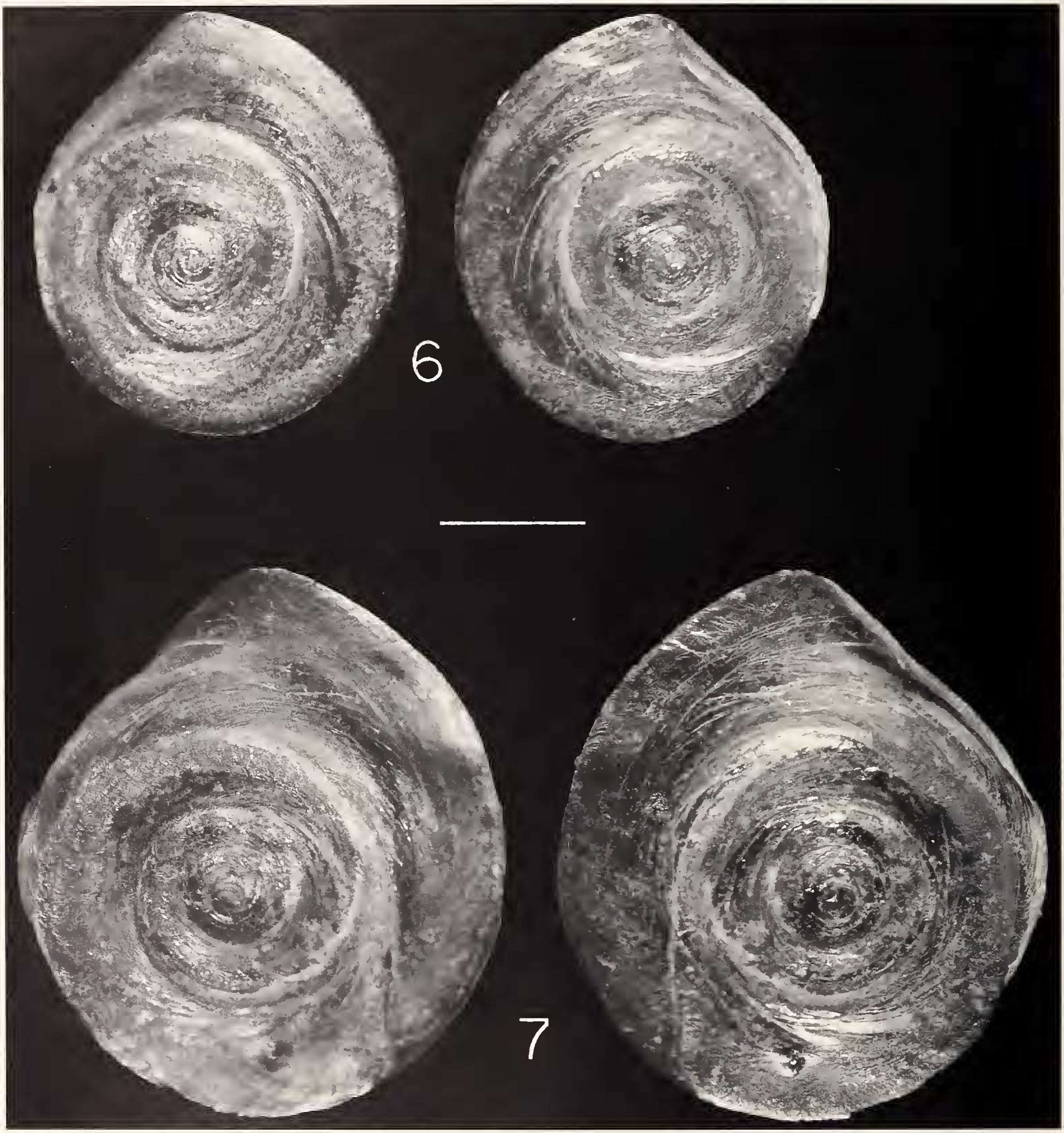
Other dry paratypes: Stations 201 (AMS C. 203497, 1 ad; ANSP 407917, 1 ad; MNHN, 1 ad; UF 285466, 7 ad, 1 juv); 203 (UF 285468, 6 ad, 4 juv); 210 (UF 285469, 1 ad, 1 juv); 213 (UF 285467, 8 ad, 5 juv).

Type locality: Madagascar, Analamera Reserve, 12°44′S, 49°29′E, 30 m, dry deciduous floodplain forest.

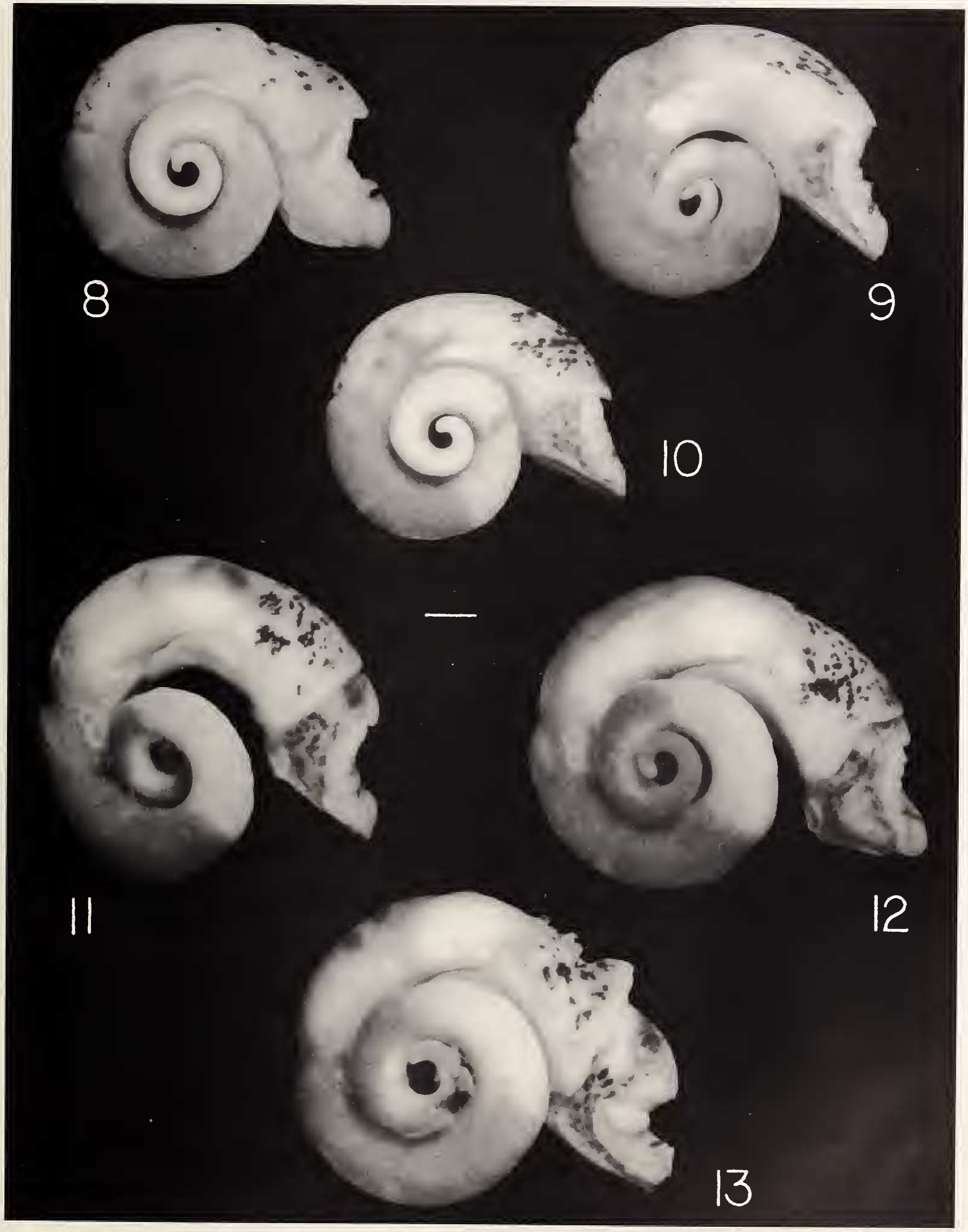


Figures 1–5. Shells of ***Ankoravaratra ambrensis*** Emberton, gen. & sp. nov. Figure 1. Holotype in three views (UF 285442). Figures 2–5. Paratypes from type locality, in one view (UF 285443). Figures 2, 3. Males, specimens #1, 2. Figures 4, 5. Females, specimens #3, 4. Scale bar = 1 mm.

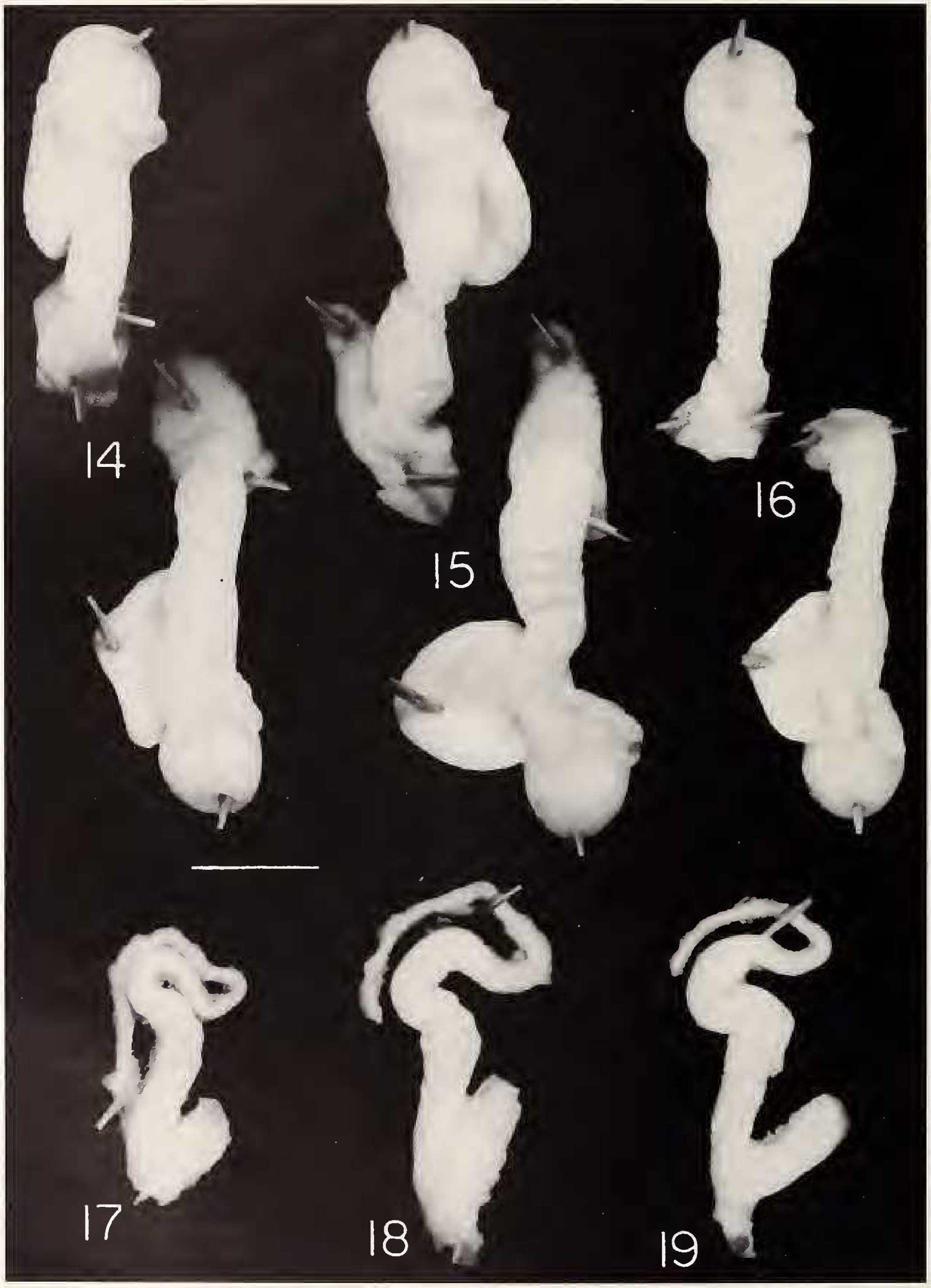
Description of holotype shell (Figure 20): Female. Diameter 9.1 mm, height 6.3 mm, whorls 5.2, umbilicus 2.6 mm. Spire low conic, sides of apex slightly concave. Body-whorl periphery rounded; suture deeply impressed, simple; whorl shoulders rounded. Aperture upright broadly oval; height 3.5 mm, width 3.4 mm; downward deflection slight, 0.1 whorl. Apertural lip reflection unknown, but reflected at umbilicus. Embryonic whorls 1.8;



Figures 6, 7. Opercula of ***Ankoravaratra ambrensis*** Emberton, gen. & sp. nov., in exterior (left) and interior (right) views (ex UF 285571). Figure 6. Type-locality male, specimen #3. Figure 7. Specimen #6. Scale bar = 1 mm.



Figures 8–13. Bodies (shells removed) of ***Ankoravaratra ambrensis*** Emberton, gen. & sp. nov., from the type locality (UF 285571). Figures 8–10. Males, specimens #1–3, respectively. Figures 11–13. Females, specimens #4–6, respectively. Scale bar = 1 mm.



Figures 14–19. Reproductive organs of ***Ankoravaratra ambrensis*** Emberton, gen. & sp. nov., from the type locality (UF 285571). Figures 14–16. Penes in dorsal and ventral views (upper and lower, respectively) of males, specimens #1–3, respectively. Figures 17–19. Oviduct-plus-seminal receptacle-plus-bursa copulatrix of females, specimens #4–6, respectively. Scale bar = 1 mm.

Table 1

Shell variation. Abbreviations: # specimen number, CBand color bands, D1.5W diameter of first 1.5 whorls, Dm shell diameter, EmW embryonic whorl count, fem female, Ht/D shell height divided by shell diameter, Um/D umbilicus diameter divided by shell diameter, W/lnD shell whorl count divided by natural logarithm of shell diameter (= index of coiling tightness), Whrl shell whorl count.

Species	Catalog #	#	Sex	Dm	Ht/D	Whrl	W/lnD	Um/D	D1.5W	EmW	CBand
ambalaniranae	UF 285436	–	fem	9.6	0.7	5.3	2.35	0.29	0.98	1.9	no
ambalaniranae	UF 285437	1	male	7.0	0.7	4.7	2.41	0.27	0.96	1.9	trace
ambalaniranae	UF 285437	2	male	7.2	0.7	4.8	2.44	0.31	0.98	1.9	yes
ambalaniranae	UF 285437	3	fem	9.6	0.7	5.1	2.26	0.30	0.98	1.8	no
ambrensis	UF 285442	–	fem	8.7	0.7	4.7	2.18	0.26	1.09	1.8	yes
ambrensis	UF 285443	1	fem	8.7	0.6	5.7	2.64	0.31	1.06	1.9	yes
ambrensis	UF 285443	2	fem	8.6	0.6	5.6	2.60	0.33	1.03	1.9	no
ambrensis	UF 285443	3	male	7.1	0.7	4.5	2.30	0.28	1.08	1.8	yes
ambrensis	UF 285443	4	male	6.7	0.7	4.4	2.33	0.29	1.06	1.9	yes
ambrensis	UF 285571	1	male	7.5	0.6	4.3	2.14	–	–	1.7	no
ambrensis	UF 285571	2	male	7.2	0.7	4.5	2.28	–	–	1.8	no
ambrensis	UF 285571	3	male	7.2	0.6	4.2	2.13	–	–	1.7	no
ambrensis	UF 285571	4	fem	8.3	0.6	4.7	2.23	–	–	1.7	no
ambrensis	UF 285571	5	fem	8.9	0.6	4.7	2.15	–	–	1.8	yes
ambrensis	UF 285571	6	fem	9.2	0.7	4.8	2.16	–	–	1.7	yes
analamerae	UF 285438	–	fem	9.1	0.7	5.2	2.35	0.29	1.10	1.8	yes
analamerae	UF 285440	1	male	7.7	0.5	4.3	2.12	0.32	1.13	–	yes
analamerae	UF 285440	2	fem	9.3	0.5	4.6	2.06	0.31	1.15	–	yes
analamerae	UF 285441	–	male	6.8	0.6	4.2	2.19	0.31	1.15	–	yes
analamerae	UF 285439	–	fem	8.5	0.6	4.7	2.20	0.29	1.10	1.7	trace
capdambrae	UF 285444	–	fem	9.1	0.8	5.1	2.31	0.23	1.06	1.9	no
capdambrae	UF 285445	–	male	6.7	0.7	4.6	2.43	0.27	1.03	2.0	no
capdambrae	UF 285446	1	fem	7.7	0.8	4.9	2.40	0.27	1.04	1.9	no
capdambrae	UF 285446	2	male	6.4	0.8	4.7	2.53	0.25	1.04	1.0	no

first 1.5 whorls 1.10 mm in diameter. Embryonic sculpture smooth. Body-whorl sculpture smooth, with faint, irregular, axial growth lines. General color orange-beige with purplish cast. Color band present, purplish brown, edged with white above and below.

Shell variation: See Table 1 and Figures 21–24.

Etymology: For Analamera Reserve.

Ankoravaratra capdambrae Emberton, sp. nov.

(Figures 30–33)

Diagnosis: Unique within the genus for its combination of large initial-whorl size (diameter of first 1.5 whorls 1.03–1.06 mm) and dry-deciduous-forest habitat.

Holotype: Station 407 (UF 285444, 1 ad).

Illustrated dry paratypes: Stations 405 (UF 285445, 1 ad); 407 (UF 285446, 2 ad).

Other dry paratypes: Stations 405 (UF 285472, 3 ad, 5 juv); 407 (AMS C.203498, 1 ad; ANSP 407918, 1 juv; MNHN, 1 ad; UF 285473, 1 ad, 4 juv).

Type locality: Madagascar, Cap d'Ambre, Ambongoabo, 12°15′S, 49°15′E, 290 m, dry deciduous forest.

Description of holotype shell (Figure 30): Female. Diameter 9.1 mm, height 7.1 mm, whorls 5.1, umbilicus 2.1 mm. Spire conic, slightly domed. Body-whorl periphery rounded; suture deeply impressed, simple; whorl shoulders rounded. Aperture upright broadly oval; height 3.4 mm, width 3.3 mm; downward deflection great, 0.2 whorl. Apertural lip reflection grading from zero degrees at upper suture to about 60 degrees at umbilicus, extremely narrow. Embryonic whorls 1.9; first 1.5 whorls 1.06 mm in diameter. Embryonic sculpture smooth. Body-whorl sculpture smooth, with faint, irregular, axial growth lines. General color brownish yellow, apex and upper whorls light orange. No color band.

Shell variation: See Table 1 and Figures 31–33.

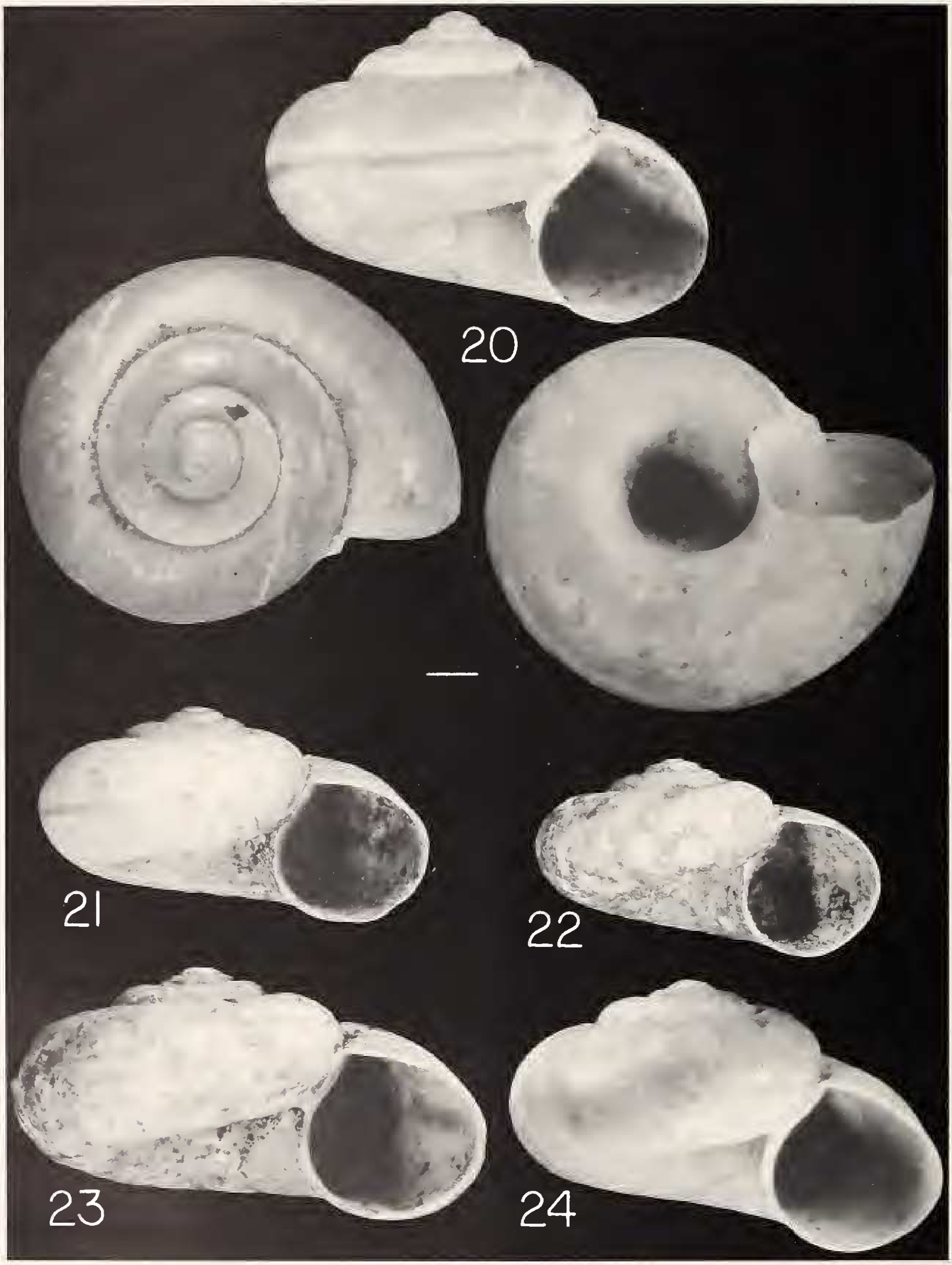
Operculum (Figure 33): As for the genus.

Etymology: For Cap d'Ambre (Tanjona Bobaomby).

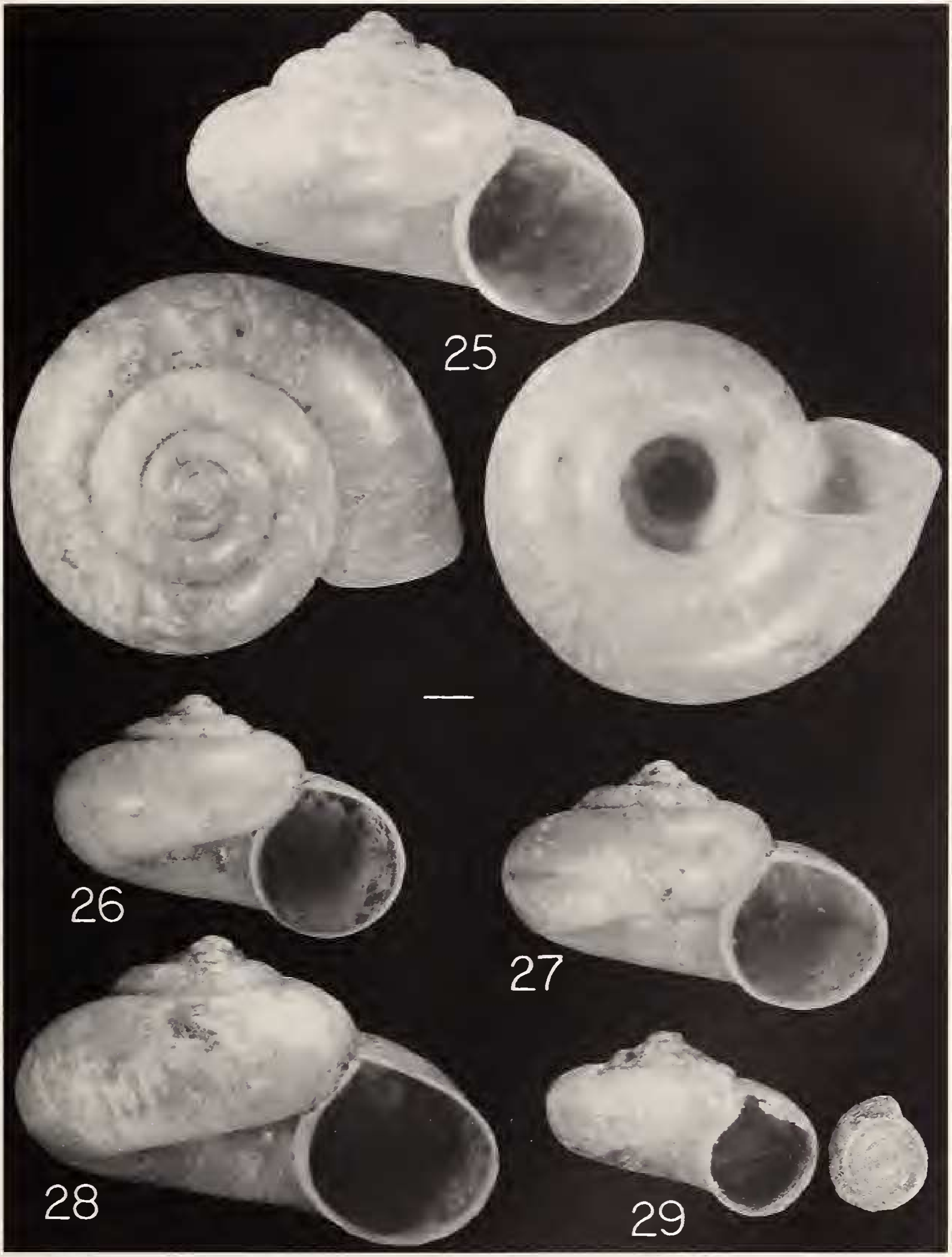
Ankoravaratra imani (Fischer-Piette, Blanc, Blanc & Salvat, 1993), comb. nov.

Chondrocyclus (?) imani n. sp., Fischer-Piette et al., 1993: 17–19, figure 11.

Diagnosis: Unique within the genus for its very small initial whorl (diameter of first 1.5 whorls about 0.89 mm).



Figures 20–24. Shells of ***Ankoravaratra analamerae*** Emberton, gen. & sp. nov. Figure 20. Holotype in three views (UF 285438). Figures 21–24. Paratypes in one view. Figures 21, 22. Males (UF 285440, specimen #1; and UF 285441, respectively). Figures 23, 24. Females (UF 285440, specimen #2; and UF 285439, respectively). Scale bar = 1 mm.



Figures 25–29. Shells of ***Ankoravaratra ambalaniranae*** Emberton, gen. & sp. nov. Figure 25. Holotype in three views (UF 285436). Figures 26–29. Paratypes from the type locality, in one view (UF 285437). Figures 26, 27. Males, specimens #1 and 2, respectively. Figure 28. Female, specimen #3. Figure 29. Juvenile with its operculum in interior view, specimen #4. Scale bar = 1 mm.

Description of holotype shell: Based on Fischer-Piette et al.'s (1993) figure 11. Diameter 7.1 mm, height 4.0 mm, whorls 4.7, umbilicus 2.4 mm. Spire low domed-conic, sides of apex slightly concave. Body-whorl periphery rounded; suture deeply impressed, simple; whorl shoulders rounded, apparently. Aperture nearly round; height 2.4 mm, width 2.5 mm; peristome reflection slight, narrow, greatest at columella. First 1.5 whorls approxi-